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Editorial.

ORGANIZATION, COHESION, AND CONSOLIDATION.

INDIVIDUALISM had its good traits in days gone by and accomplished much advance. In some respects, given the right sort of leader and governor, abuses and injustices were perhaps more quickly remedied and set right than at present. But in many cases the harsh autocrat could ride roughshod over individual resistance and effort. Then, single stars shone serenely and gave a certain amount of brilliance and stability to the industrial, political, and scientific firmament. Now, men of the same way of thinking and with identical ends in view banded together; the stars coalesced into moons, whose light diminished the refulgence of the smaller luminaries. In other cases splendid, powerful, and illuminating suns arose, lighting the way for the progress and betterment of mankind and throwing the moons into the shade. The Amalgamated Society of Engineers, the Spinners' Union in the cotton trade, the Dockers' Union in transport circles, the Miners' Federation are instances where bodies of individual men have united together and consolidated to uplift their trade and calling. The medical practitioners of the land know how to protect their rights, advance their claims, and secure their position by a pull together. Lawyers and politicians, whilst frequently speaking against the opinions of others of their fraternity, understand how to clear the decks for action when their ship is assailed or threatened. The members of a trade or profession do not advance nowadays by the isolated efforts of individuals, but by cohesion, concentration, and concerted action. The present War will be won as much by reason of the Allies sticking together and acting in unison as by any other force that can be created or brought into play. In good collective exertion broad views will be taken which benefit the weaklings and include them in the general measures of progress, whilst

not forgetting the claims and aims of the stronger units to serious consideration. Fads, foibles, magnified importances of trifling value to the good of the general body will not be allowed to divert and distract the leaders of communal movements or the movements themselves from the straight and forceful way to social and material betterment.

On what foundations have these communities of aims and interests been erected? How have they grown from toddling infancy to robust and vigorous manhood? Is it not by being built up by energy, watchfulness, cautiousness, rules and regulations, and money? Through lean years, good and ill report, success and failure, the members of the bodies have stuck together. If they had dared and risked more some of them would have won more for their class. By political power and the right of combination they have uplifted themselves. Clearer vision and more decided views might have led them further still. There is a tendency at times for those who make requests or desire objects to be too easily pleased and to let the stiff upper lip relax too soon.

We have tried to indicate the way in which bodies of men advance and obtain their rights, and we ourselves can take lessons from history and daily events. Organization and consolidation offer the best chances of success in attack and defence.

Only recently we have seen how the best organized body in our own circle can put up a good defence against a charge of laxity made against veterinary inspectors in connection with an outbreak of foot-and-mouth disease. Because of a vagary in the occurrence of the disease, unaccountable to the lay mind, the Central and Associated Chambers of Agriculture asked the President of the Board of Agriculture to institute an independent inquiry into an outbreak of the epizootic at Butleigh. The President decided that it would not be in the interests of the efficient administration of the Diseases of Animals Acts to have an independent inquiry, he did not propose to delegate the Board's responsibility to any other body, and he considered the action of the veterinary inspectors quite correct.

Grievances can only be remedied by concerted action and the powerfulness of the force brought into play. In this connection we think something stronger, if possible, will have to be undertaken before the question of H.M. Treasury and a long service pension, as relating to Mr. H. T. Ashbee, can be focussed so that both parties may see eye to eye.

We should all be doing as much as we can now to set our own house in order. There will be ground to gain, problems to solve, attacks to repel, and much defence work to be undertaken after the War. If we are to cope with the business we must be united, determined, far-seeing, and not poverty-stricken as a body.

G. M.

WELCOME INFORMATION AND THE COROLLARY.

THE following question was put on May 22, in the House of Commons, by Mr. MacCallum Scott, M.P., to the Under-Secretary of State for War: "Whether officers in the A.V.C. on active service are prohibited from contributing to professional papers records of clinical, medical, or surgical cases which come under their notice; if so, what is the object of such restriction; whether he has considered its prejudicial effect upon the development of veterinary science; and whether he can hold out any prospect of a relaxation of the restriction?"

Mr. Tennant replied: "The answer to the first part of the question is in the negative, and the second part therefore does not arise."

There has been a scarcity of clinical reports from those engaged in Army practice for some time now. It was not so apparent in the early days of the War. This has rightly or wrongly led to the assumption that restrictions of some kind exist on the furnishing of records of interesting cases, observations, or investigations eminently helpful to the advance of veterinary science.

The above-quoted query and answer should clear the air as regards this matter. Opportunities for unique experience in respect to injured and ailing horses exist in our military spheres at the present time, and many of the men in the A.V.C. have facile pens. Is it intended to hoard up all the valuable scientific pabulum that is in process of being gathered, and then to flood the professional papers with it in peace time and cause a literary and mental glut? This can never be so beneficial as a gradual unloading of the information when the necessity for its application is most evident, when the field is the most extensive, and when the lessons to be learnt can be grasped and assimilated step by step.

Although the health of the Army's horses is stated to be very fair, many interesting and valuable facts in connection with contagious and infectious diseases must have been observed during transport and in field life. Where horses, too, have been gathered together in such large numbers rare and isolated cases of exceptional interest and value must have been dealt with. Occasionally, also, one is led to expect a contribution to canine medicine and surgery, for dogs are doing their little bit in the conflict as well as horses.

We hope to receive some very readable notes as a result of this dissertation, and trust that those of our *confrères* in prominent positions in the Army will not forget us, but encourage the reporting of interesting facts, and do what they can to help on the further development of veterinary science.

G. M.

Original Communications.

CYSTIC CALCULI IN THE DOG: A RÉSUMÉ.

By FRED. C. MAHON, M.R.C.V.S.

Southampton.

The Urine of the Dog.

Is there anything which can go to prove a tendency owing to hæmal or chemical changes, bacterial invasion, or, indirectly, mode of living, properties in food and chemical changes to bring about the formation of renal or cystic calculi in dogs. Many cases occur in this animal, oft unsuspected during life, yet found on making *post-mortem* examinations? During the past year I have had four marked instances, but select the following to illustrate my point.

History.—My patient was a field spaniel, aged 3 years. He had only been a few weeks in his owner's care, but from the first day was noticed to have difficulty at times to micturate freely or naturally, to pass blood occasionally, have a capricious appetite, to shiver inordinately, straggling gait at times, fickle—if one can call it so—behaviour, being excited one moment, morose the next. Some three weeks after purchase my services were requisitioned and I was asked for a diagnosis. After careful examination of the penis, testicles, passing of catheter, rectal examination, &c., I diagnosed cystic calculi, and favoured, however, renal trouble—ulceration of kidney (pelvis) of some time standing—and calculi. *Post-mortem* examination showed no renal calculi, but an ulcerated bladder, both kidneys intensely inflamed, with sixty-three calculi of various sizes, shape, and colouring. A rough sketch of a few promiscuously chosen will serve to illustrate the case more forcibly.

Furthermore, the gastro-intestinal omentum showed intense inflammation. The lining membrane of the gastro-intestinal tract was remarkably free from congestion, as one would expect.

There was hæmorrhagic effusion into abdominal cavity, heart soft, and a few hæmorrhagic infarcts to be seen, with serous effusion into the pericardial sac.

The bladder was ruptured for about 1½ in., edges jagged, dark coloured, and several pyramidal-shaped calculi driven together and protruded through the muscles of the bladder, and serous coverings into the abdominal cavity.

On carefully dissecting the penis the following salient lesions were shown: A few inches from the prepuce marked ulceration of the urethra, with enlargement and ulceration of the prostate glands, and commencing ulceration of the "os penis." The testicles were apparently healthy.

Reviewing diseases of the urino-genital system, may I allude to (1) cystic calculi; (2) renal; (3) pyelitis (inflammation of the bladder); (4) pustular erosions in urethra, glans penis, kidneys of the dog. This brings one to a wide sphere, where scope is given one to reason as to the causation of the many ailments peculiar to the dog. His life-history tends to produce so many of these conditions, and the facilities afforded by climatic changes, dirt, connection with bitches suffering often from venereal diseases render him, with the cat, the most subject to diseases affecting the organs above enumerated.

Bacterial Invasion.—I take as my standpoint as regards microbic mischief the part played by *Bacillus coli*, ordinarily a normal inhabitant of the intestinal canal of the dog, and the grave possibilities of its taking on a virulent stage due to climatic, dietetic, and other changes.

For example, take inflammation of the kidneys, and the deposit very often as a sequel of gravel; the urine tinged with blood, with mucus accompanying the same, access of the *B. coli* from ulceration of the parts, and its subsequent entrance into the circulatory system. Would not these conditions start the formation of calculi in the pelvis of the kidney, descend into the bladder, and afford the results I found to a marked extent in my spaniel patient?

Cystic Calculi.

These may and are undoubtedly caused by the use of hard water (or water containing lime) for drinking purposes, esepcially where an animal as the horse is worked for hours at a stretch, and not given an opportunity to urinate. This pertains to the horse. Relative to the dog, he has access to everything and anything, and fortunately escapes by virtue, not of anything

peculiar in his digestive or urinary apparatus, but by organisms minimizing or neutralizing the germs he swallows when drinking from polluted streams, &c.

THERAPEUTICS. VACCINE.

Therapeutic opportunities for gonococcus vaccine arise when dealing with cystic, renal, and genital diseases of the dog and bitch, especially in cases of staphylococcus invasion of the urinary tract. This was instanced by Wright (*Proc. Roy. Soc. Med.*), "Vaccine Therapy Debate," 1910, vol. iii, where he favoured an association between this infection and calculus formations in the human subject, with the suggestion advanced by Walters in the same volume to the effect that the lowered resistance to staphylococcus manifests itself in diabetes by the tendency to carbuncle, &c., which may rather be a cause than a result of diabetes.

Beside the cystic calculi in the case of the spaniel, I found four in the urethral canal *post mortem*, very sharp edges to triangular-shaped formations, and which, injuring the urethral membrane, caused the discharge with urine of the blood noticed by owner and myself. As regards treatment, death resulted so quickly that I used but few, but had opportunity of giving several doses of adrenalin, both hypodermically and by the mouth.

The dog's appetite was gone, a haggard appearance, straggling gait, marasmus rapid, and death on fourth day after entering the infirmary. Milk, beef-tea, peptone elixir, brandy, all failed to rouse my patient, whom I foresaw from the first examination had no possible chance of recovery.

Before concluding my case, I may add I made inquiries relative to the dog's past history from his breeder and final owner as to any particular disease or injury encountered, but they stated that he was a strong, healthy animal, and commenced from an unknown cause to fail suddenly.

My opinion privately is that, being a good specimen, he was put to stud purposes too frequently, and following a severe chill, nervo-muscular exhaustion, the disease of the penis may have started the complaint, and propagated from the invasion of bacteria to the bladder and kidneys, bringing about the marked pathological changes noted.

The subject to be thrashed out would fill a volume, but no

more interesting cases are to be found in the diseases of the dog or require more careful thought, care in handling and mixed therapeutic and vaccine treatment than those of the renal, cystic, and generative organs in both the dog and bitch.

In conclusion, may I again add the long-standing lesions, the newly formed ulcerations of the urethra, the commencing necrosis of the "os penis" appear to convince one that the whole trouble arose from the penis and travelled upwards in this case, and that the renal conditions were only sequelæ?

Unfortunately, want of time and facilities for investigation are lacking in dog practice to very many, but I venture to add we know but little truly of many ailments of the dog; in fact, are only just commencing, as it were, to touch upon diseases unknown and unrecognized hitherto.

See *Veterinary Notes*, January, 1916, and William Scott, F.R.C.V.S., of Bridgwater, "The *Bacillus coli communis* in Veterinary Practice." He says:—

"One can easily understand the prominent part the *B. coli* would take in diseases of the kidneys. They are often the seat of *B. coli* invasions. In the female, particularly after parturition, the infection is urogenic in origin, and this point is rather substantiated by the fact: in practice one seldom gets specific bacterial invasions of the kidneys in the male, unless they are of hæmatogenic origin. Colon vaccine is now being tried for metritis, renal, cystic, and urethral affections, also in enteritis, in which disease in the horse and dog I trust at a future date to record my experiences, and vaccine treatment, as I hold strongly that *B. coli* and other organisms are the cause of enteritis in the majority of cases."

Therapeutics.

Both in human subjects and in canine practice, "Piperazaine" (Burroughs, Wellcome and Co.), 5 gr., tabloid form, to be given after a meal has been tried with marked success. It is claimed that this drug acts as a depressant in some cases, therefore it is advocated, and I generally use 2-gr. doses at first, and gradually increase to 5 gr. It is further claimed for this agent that it is believed to be a stronger solvent of uric acid than any salt of lithium.

For the latter drug it is believed that its administration forms

soluble urates, therefore it plays a great part in human medicine, and especially in gout and uric acid calculus. I have used this alternated with adrenalin in old patients suffering from incontinence of urine and sabulous deposits in the same, with amelioration of the graver symptoms.

Potassium citrate is also strongly recommended for patients suffering from bloody urine with uric acid deposits, and should be useful in canine practice.

In many cases of sabulous deposits in the bladder mineral acids, as nitro-hydrochloric acid dilutum, in my experience afforded relief and prolonged life materially.

Selected Article.

A STANDARD METHOD OF TESTING ANTISEPTICS FOR WOUNDS, WITH SOME RESULTS.

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Captain, R.A.M.C. (T.F.); Director of the Laboratories, King's College Hospital.

One of the most astonishing medical facts in connection with the War is that there is no sort of agreement as to the best method of treating septic wounds. Are we to use antiseptics at all? And if so, what antiseptic? An impartial observer might come to the conclusion that the best treatment depended on the locality. In France, he might say, wounds do best without any antiseptic at all; in England, especially in the Midlands, Dakin's antiseptic is the best; whereas, when we cross the Tweed, there is nothing to compare with eusol. The fact is, of course, that good results are obtained by all methods (why this is the case I shall discuss in a subsequent paper), and that the skill of the surgeon is of much greater importance than the particular form of lotion he happens to be enamoured of for the moment. I think we may lay down the general proposition that if a wound is properly cleansed and properly drained at a sufficiently early period, there ought to be *no* deaths from sepsis. I am speaking exclusively of wounds as I have seen them in France. But this does not absolve us from the duty of testing all methods of treatment which may be applied subsequently to this surgical toilet of the wound, for some may give us quicker and more

painless results than others, and may be easier of application in unskilled hands—a point of considerable importance under conditions such as obtain at present. It behoves us, therefore, to study very carefully all the processes which go on in a wound, and, in particular, the effects of the substances which we propose to apply thereto; and to study them, not only in relation to their action on the bacteria in the wound, but also on the cells and juices of the body itself. The latter is a matter of great difficulty, and I defer its consideration for the present.

It would appear obvious that the first essential in the study of antiseptics for this purpose would be a determination of the relative (and, if possible, absolute) potencies of the various substances which are in use, and it is very surprising to find that this has not been done. Thus I find in a recent paper the carbolic coefficient of a certain antiseptic is solemnly quoted as affording evidence of its value in wounds! Applying this test, we should be led to the belief that perchloride of mercury would sterilize wounds or the secretions from them at a dilution of 1 in 15,000 or thereabouts, whereas it is actually efficacious in a dilution about 100 times less. The carbolic acid coefficient may have a commercial value, but it has no other. More recent writers have tested the action of their antiseptic on bacteria suspended in serum. This is much better, but it is still not good enough. I know of no condition which occurs in surgical practice in which the problem is to sterilize blood serum.

In the early stage of a wound it is filled with blood and blood-clot; in the later it is filled with pus. Obviously, therefore, we should test the action of antiseptics on these substances. Now pus is a very undesirable substance to test in this way for several reasons. In the first place, there is no uniformity in its composition, either as regards the substances in solution or as regards the number of cells. And, more important, the number and nature of the organisms vary enormously, so enormously as to deprive our results of any value whatever. For example, pus containing streptococci only may be completely sterilized when mixed with an equal volume of 1 in 60 carbolic for fifteen minutes, whereas if the spores of *B. perfringens* are present (as is usually the case) they are not necessarily killed when the pus is mixed with equal volumes of 1 in 20 carbolic and incubated at the body temperature for two days. I suggest, therefore, that unless we

can find a method of preparing pus of standard composition, and containing a standard number of bacteria, we should abandon this method of testing antiseptics.

Blood presents no such difficulties. It is always at hand and always reasonably constant in composition, and we can add to it what bacteria we like and in the proportions we like. Moreover, it is the actual substance that we have to deal with if we attempt to sterilize a wound in the earlier stages. Blood therefore appears ideal for the purpose.

In actual practice we have to prepare the blood so that it does not clot. We may use citrated blood, using the smallest amount of citrate possible so as to avoid excessive dilution, but this method fails us if we have to deal with antiseptics containing calcium salts, for these will bring about coagulation in our citrated blood. A better method, though one that is a little more troublesome, is to use "reconstituted blood," made by adding equal amounts of serum and of washed corpuscles. It is prepared as follows: Collect some blood from the finger in a Wright's capsule and allow it to clot. Collect about the same amount of blood, allowing it to drop into citrated saline; centrifugalize; decant off the clear fluid; add normal saline, stir, and centrifugalize again; again pipette off the supernatant fluid and replace it by serum in amount equal to the deposit of corpuscles, and stir. This will give you a fluid almost identical with blood, except that it is uncoagulable.

As regards the organism to be added, for general purposes *Streptococcus fæcalis* (or the enterococcus) is all that can be desired. It is our chief enemy in wounds; it can always be obtained without any difficulty in pure culture; it grows rapidly, so that the results of tests made in the morning can be read off in the evening; and, as a small but important practical point, it readily emulsifies, so that there are no masses to resist the action of the antiseptic. Of course, for other purposes other cultures may be used. The inventor of a new antiseptic might prefer to use *B. coli* or *B. typhosus*, which are much more easily killed, whereas the opponents of all antiseptics might use the spores of *B. subtilis*, and find that it was almost impossible to kill them by any antiseptic; and justify his action by showing that they were very common early infections of wounds. But the streptococcus is sufficient for all ordinary purposes.

Next, as regards the number of these bacteria. This is a point of very considerable importance, and one that calls for some theoretical consideration. The death of a bacterial cell might be considered as being due to the combination of a certain number of molecules of the antiseptic with the protoplasm of the cell; and hence it might be argued that the amount of antiseptic required would be proportionate to the number of bacteria, supposing, of course, that they are suspended in an inert fluid. This is incorrect, for the reason that all bacteria in an apparently homogeneous culture are not alike. Some, perhaps, have just divided, and have not formed a protective cell-wall; others, *pace* Weismann, are decrepit from old age; whilst still others are as strong and resistant as it is possible for a bacterium to be. Hence, if we test our antiseptics on a small amount of culture, we shall get varying results according to the condition of the microbes that we happen to take. We can overcome the difficulty in two ways: by using large volumes of the mixture to be tested or by making a relatively heavy inoculation of the blood we are going to use as our test fluid. This is the more convenient method, and in order to take a definite figure I have used throughout a mixture of 9 parts of blood and 1 part of an 18-hour culture of streptococcus, containing about 250,000,000 cocci per c.c. It would perhaps be a little more accurate to count the culture before use, and to add a definite number, but if the same culture is inoculated in the same way into the same amount of standard broth the results are very constant, and with the large implantation given small variations are not of much effect. This is one of the advantages of a heavy implantation, such as I recommend.

The next question concerns the time during which the antiseptic should be allowed to act. This brings us to a point of the greatest importance, but one, I think, that has hardly been adequately dealt with. All antiseptics combine with proteins in solution, or with cells, and hence bacteria lying in pus or blood are shielded from their action. This is recognized as the "quenching" action of these fluids, and it is well recognized that the effect is much greater with different antiseptics; mercury salts, for example, are quenched to an enormous extent, carbolic acid relatively but little. But this is not the whole story. The mixtures of some antiseptics and blood will become an unfavour-

able culture medium for bacteria, or the compound of the antiseptic and the protein will dissociate, giving a slow but continuous antiseptic action, such as is desired by some surgeons, and referred to as a "depôt-action." With other antiseptics this is not the case, and the antiseptic is either completely destroyed or, at least, rendered inert by combination with protein. Hence, if we test the former on infected blood, making a mixture that is not completely sterilized in a certain period of time, say fifteen minutes, and then re-test from time to time, we shall find the number of bacteria will steadily fall off. With the second group, on the other hand, there will be a transitory fall in the number of bacteria, after which they will grow, perhaps not so well as before, but under some conditions much better. Carbolic acid is an example of the first class, eusol of the second. For example, a mixture of carbolic acid and infected blood which is just not sterilized in a quarter of an hour will be completely so in one hour, whereas a mixture of eusol (undiluted) and infected blood in equal parts will show some diminution in the number of bacteria if tested after a quarter of an hour, whereas if it is re-tested after one hour abundant growth will have taken place, and it will be indistinguishable from the control. I know this will appear a hard saying to many, but I have no doubt as to its correctness; the addition of eusol in amount insufficient to cause complete destruction of the microbes has no appreciable deleterious effect on the fluid as a culture medium for what remain. I advise, therefore, that the effect of the antiseptic shall be tested after two periods of exposure, and for all practicable purposes these may be fifteen minutes and sixty minutes. It might be a good plan to add a third, two hours.

As regards the temperature of exposure there can be no difference of opinion. The mixture of antiseptic and infected blood must be incubated at the temperature of the body, the temperature at which they are to be used in practice.

Lastly, what criterion of killing are we to adopt? There is a general idea that the planting-out subsequently to the exposure to the antiseptic must be done in a large quantity of broth, so that any antiseptic may be diluted to such an extent that it ceases to act. I think this is a theoretical point only, and the method quite unnecessary in actual practice; and it has the great objection that it only tells us whether there is or is not complete sterilization of our test-fluid. If, on the other hand, we plate out on agar

and count the colonies that grow up we can tell what dilution of antiseptic will cause partial sterilization, and what complete; and, moreover, it avoids the possible fallacy that a single microbe which had accidentally escaped contact with the antiseptic might vitiate our results. The theoretical objection to this method does not take into consideration the fact that most—as far as I know, all—antiseptics diffuse well through agar, so that it is not correct to argue that when a mixture such as I have described is plated out the antiseptic continues to act on the microbes for an indefinite period; it diffuses rapidly away into the substance of the agar, the microbe remaining on the surface. As a matter of fact, I have made parallel observations with the two methods, and have got in most cases absolutely identical results.

The technique I have used is quick and easy. The requisites are: (1) Infected blood, prepared as described above; (2) the antiseptic to be tested, in suitable dilutions; (3) a stock of capillary pipettes, such as are used in the opsonin technique; (4) large agar-plates, deep, so as to allow diffusion of the antiseptic, and surface dry; (5) a standard platinum loop about 2 mm. in diameter; and (6) some slides which, when sterilized by flaming, are used to prepare our mixtures on.

The process is as follows: Fit an india-rubber teat to one of the pipettes, and make a grease-pencil mark on the latter about 2 in. from the tip. Then take one volume of infected blood and one volume of antiseptic and mix thoroughly on the sterile slide. Suck back about half into the pipette and seal. Take the other half into another pipette and seal it also. Place the two pipettes in the incubator, noting the time (an opsonin incubator is a great advantage). Repeat the process with the other dilutions of antiseptic, making in each case a mixture of equal parts of antiseptic and infected blood. At the end of a quarter of an hour remove the first of your dilutions, fit on an india-rubber teat, and cut off the tip of the pipette. Sterilize the end lightly in the flame, and expel the contents of the pipette on to a sterile slide, and mix thoroughly. Now take a loopful, avoiding bubbles, with the platinum loop, and spread it out over as large a surface as possible on the agar plate. Repeat this with the other dilutions when their fifteen minutes' incubation is up, and with the second series after an hour has elapsed. Incubate the plates; growth is complete in twenty-four hours, but the results can be read off before then.

I append some of my results:—

Antiseptic	15 minutes		60 minutes	
	Does not kill	Kills	Does not kill	Kills
Carbolic acid	1 in 70	1 in 60	1 in 60	1 in 50
Eusol	Undiluted	—	Undiluted	—
Dakin	,,	—	,,	—
Perchloride	1 in 100	1 in 80	1 in 100	1 in 80
Biniodide	1 in 60	1 in 40	1 in 60	1 in 40
Iodine	1 in 100	?	1 in 100	?
Lysol	1 in 40	1 in 30	1 in 150	1 in 120
Malachite green	1 in 250	1 in 200	1 in 250	1 in 200

The expression "does not kill" may be taken in most cases as implying that it causes a diminution in the number of organisms, but does not effect actual sterilization; this dilution, therefore, may be taken as a convenient end-point if various antiseptics have to be compared. For instance, there is a tradition that eusol and Dakin's solution are several times more powerful than carbolic acid, whereas, as a matter of fact, it is seen when this method of testing is used that these substances undiluted (0·5) are about equal in effect to a 1 in 70 dilution of carbolic—in other words, carbolic acid is seventy times as strong. But this is only if they are tested at the end of a quarter of an hour; if tested at the end of one hour the chlorine preparations appear to be quite inert, the surviving bacteria having grown until, unless special methods of plating are used, they appear as abundant as in the controls. To demonstrate complete killing with eusol it is necessary to have approximately two volumes of the antiseptic to one of blood.

The killing point of iodine is not given. It is about 1 in 60, but at a dilution like this the blood is turned into a thick pasty mass, very unsuited for accurate work. Iodine is sometimes used in a dilution of 1 in 300 or 400 to "sterilize" wounds. Such a dilution is quite inert.

The results with malachite green may excite surprise; it is by far the most powerful antiseptic that I have investigated. Unfortunately, its action on the living cells is even more powerful, otherwise it would be the ideal antiseptic for surgical use.

This work was carried out for the Medical Research Committee, to whom my best thanks are due.—*Lancet.*

Abstract.

TUBERCULOSIS IN THE DOG AND CAT.*

By W. REID BLAIR, D.V.Sc.

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VETERINARIANS, as a rule, have looked upon tuberculosis in the dog, until a comparatively recent date, as an unknown or exceedingly rare disease. So many cases have come under my observation during the past few years, that I feel I have heretofore been overlooking the condition. During the past few years a considerable amount of literature has appeared on tuberculosis of the dog and cat. It is principally due to the work of Eber, Jensen, Cadiot, Douville, Hebrant and Antoine that this disease in the dog has been placed on a firm basis. Being particularly interested in tuberculosis from a comparative standpoint, I have taken every opportunity to discuss the subject with the men whom I knew had investigated the disease to a considerable extent, and I was able to get much information from the study of pathological specimens, and from statistics of the Small Animal Clinic at Berlin under Professor Regenbogen. Also from Professor Eber, the famous tuberculosis expert, and Director of the Veterinary Institute Laboratories at Leipzig, whose work for a number of years has been on the relationship of the various types of tubercle bacilli. It may be of interest to mention in this connection that Professor Eber has repeatedly shown that it is possible to so alter the human type of tubercle bacillus, by systematic passage through animals, that, with the means at present at our disposal, they cannot be distinguished from bacilli of the bovine type. His researches furnish abundant evidence that the two types of tubercle bacilli, the human and the bovine, are not types of sub-species with constant characters, but rather varieties of one and the same bacillus, with relatively variable characters. He recognizes that the bacilli cultivated directly from the human or bovine sources possess certain biological characteristics which permit of a distinction in the majority of cases between the human and bovine types.

In his experimental work in carrying the human type tubercle bacillus through guinea-pigs, calves and cattle, Professor Eber

* Read at the meeting of the New York State Veterinary Medical Society, Ithaca, New York, 1915.

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succeeded repeatedly in changing the morphological characters of the human bacillus to that of the bovine type.

This work of Professor Eber is splendidly demonstrated by means of gross pathological specimens showing the lesions through the successive stages.

In Brussels, and again in Paris, I learned that tuberculosis in dogs was not an uncommon disease, many cases having been apparently traced to ingestion of food contaminated in cafés and restaurants by sputum from tuberculous subjects.

Dr. Winchester, of Lawrence, Mass., who has been for many years especially interested in tuberculosis, recently told me of several cases of tuberculosis in domestic cats which had come under his observation.

In two instances the cats made their homes in cafés, and their food was principally what they picked up from the floor, consisting of scraps of cheese, bread and meat, material which was doubtlessly contaminated with sputum from tuberculous frequenters of such places.

In certain parts of Switzerland also the disease among dogs is frequently seen. This is doubtless owing to the high percentage of tuberculosis in these localities and the opportunity for infection afforded by allowing animals raw meat or offal, or unboiled milk from tuberculous animals. It is not strange that the disease is prevalent under such conditions.

Two papers have recently appeared which have thrown much light on this disease as affecting the dog and cat. One of these by a Frenchman, Professor Douville, entitled "Tuberculosis of Domestic Carnivoræ," the other by Professors Hebrant and Antoine on "Tuberculosis of the Dog and Cat."

Professor Douville places the relative frequency of the disease in the dog at about 4 to 4½ per cent., these statistics being based on 20,000 animals examined when alive or after *post-mortem*. In cats the frequency is placed at about 1 per cent.

Professors Hebrant and Antoine, taking the number of animals they have treated as a base, place the relative frequency of tuberculosis at 16 per cent. in the dog, and about 7 per cent. in the cat.

The disease is more frequently seen in cities than in country districts, and I believe this is due to the fact that in a large percentage of cases of tuberculosis in dogs infection is from human sources.

It is generally held by those who have made a careful study of tuberculosis in the dog that the source of infection is nearly always from human origin.

In several of my cases the bacilli were demonstrated to be of the human type. With a single exception all the dogs and cats which I have examined, and recorded particulars of in this paper, were house pets, and in the case of three dogs and one cat, the owners of the animals, I believe, were suffering from some form of tuberculosis, generally pulmonary. The disease is contracted principally by ingestion, and possibly by inhalation, especially in the pure pulmonary form of the affection.

Symptoms.

The disease, as a rule, runs a chronic course, but occasionally it may assume an acute form.

It generally runs a silent course for some time, then suddenly manifests signs of effusion into the thoracic or abdominal cavities. At other times these effusions follow a chronic cough or as a result of pressure of swollen lymphatic glands in the region of the throat or neck.

In some instances there is an occasional short cough, which may increase and continue for several weeks, or even months. The animal gradually becomes miserably thin and wastes visibly from week to week. The soft parts of the scapula and dorsal region become shrunken, allowing the bony parts to stand out prominently, the flanks seem to be slightly fallen in, and the abdomen appears pendulous. The mucous membranes are pale and the facial expression is dull and stupid. The coat is dull and erect, giving the animal an unthrifty appearance, and it seems to tire on slight exertion. There is usually a steady loss of condition, while the appetite generally remains good. Later, when the lungs become extensively involved, there is a dry, hoarse cough, which may be induced by making the animal get up and move about. After a time this cough may become more frequent and looser, and during the effort of coughing a muco-purulent discharge may be ejected from the mouth.

When the pleura is affected the respiration becomes difficult, short and sharp, and very often accompanied by moaning and groaning at each respiratory movement. If there is much fluid in the pleural cavity the flanks heave or have a pumping-like action, accompanied by ballooning of the cheeks. When the liver

is involved a slight icteric condition of the visible mucous membranes is seen. Palpation will detect enlargement of this organ, nodules on its surface, and abdominal effusion.

The bowels are very irregular, alternating between constipation and diarrhœa, the diarrhœal discharge often containing blood-stained mucus.

The temperature is very irregular and oscillating, varying from day to day, and during the twenty-four hours from 102° to 104° F. Occasionally it will be subnormal. As the disease progresses the cough and emaciation progress, the appetite becomes very capricious, and the animal presents a sorry sight. The slightest exertion gives it great distress. Fainting spells are common at this stage, and are brought on by slight exertion or excitement. Excessive thirst and polyuria are prominent symptoms.

In some cases tuberculous dogs may live for many months without showing great disturbance, while in other cases death is quickly brought about by exposure, resulting in pneumonia.

Aspirating the fluid from the abdominal cavity gives only temporary relief, making it necessary to repeat the operation at intervals of a week to ten days. The fluid obtained is nearly always blood-stained, and quickly solidifies on exposure to the air.

Lesions of Tuberculosis.

The lesions of tuberculosis are found affecting almost all of the organs of the thoracic and abdominal cavities, but the organs most frequently affected appear to be the lungs, pleura, lymphatic glands of the thoracic region, and the liver.

The lung tubercles are generally of a greyish colour and of a fibrous consistency. They may undergo softening, and then the centres of the tubercles contain pus. In some cases typical miliary tubercles, resembling the same type of the disease in the human, are seen, the lesions being scattered throughout the substance of both lungs.

The lymphatic glands, especially the bronchial and mediastinal, are generally enlarged whenever the thoracic cavity is involved. Sometimes these glands are enlarged to such an extent as to give rise to the opinion that they are new growths, and they have doubtless been mistaken for sarcoma.

The glands are sometimes firm or fibrous in consistence, but

they more frequently undergo softening in the centre, and on section show a sticky yellowish or milky fluid, or a cheesy mass.

The pleural cavity frequently contains a large quantity of amber-coloured serous fluid. The lesions on the pleura consist of thickening with large irregular masses, having on their surface firm granulations resembling miliary tubercles found elsewhere.

The pericardium shows similar lesions, and the pericardial sac may contain a considerable quantity of blood-stained serous fluid.

The intestines show ulcerative lesions, and the mesenteric glands are generally enlarged when the intestine is involved.

The abdominal cavity may contain several quarts of yellowish blood-stained fluid. The peritoneum shows typical miliary tubercles resembling the pearly lesions so often found in tuberculosis of cattle.

The liver, next to the lungs, is most frequently the seat of tuberculosis. The tubercles here are greyish or whitish in appearance, fibrous and firm, and vary in size from that of a pea to an orange. Some bulging out on the surface to such an extent that no difficulty is experienced in detecting them on palpation.

The kidneys show various sized tubercular masses generally confined to the cortex. In the cat, tuberculosis is most frequently seen in the kidney, and I have seen the structure of one kidney entirely replaced by a tubercular mass.

Case No. 1.—Cocker spaniel, male, 4 years old. Had been for the past three years the constant companion of his owner, who was suffering from pulmonary tuberculosis, and was, at the time of the animal's death, an inmate of the Seton Home for Consumptives in New York City.

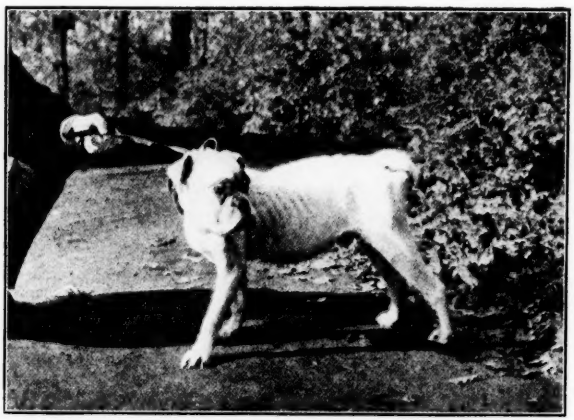
When the dog was examined it was suffering from pneumonia, pleurisy, and ascites. Was in fair condition of flesh, but appeared much older than four years. The dog died two days later, and an autopsy showed extensive generalized tuberculosis. The lungs were greatly congested and showed chronic caseated tubercles; the heart and pericardium, extensive tubercular deposits, with adhesions to the lungs and myocardium. There was about three quarts of bloody serous fluid in the thorax. The pleura showed numerous small miliary tubercles. The anterior mediastinal lymph gland was greatly enlarged, and showed numerous areas of softening.

The liver was greatly enlarged and covered with small miliary

tubercles. There was a great amount of fluid in the abdominal cavity. The spleen was normal. The mesenteric lymph glands were enlarged and œdematous. The right kidney showed several tubercular foci about ½ in. in diameter. The diseased organs were placed at the disposal of Dr. Park, of the New York Health Department, who demonstrated the tubercle bacilli in the lesions from the different organs to be of the human type.

Case No. 2.—English bull, male, 2 years 11 months old, owned by Mr. S., N.Y. City. In good health the dog weighed 55 lb., and was very active.

Early in April he got into a fight, and after the owner



Case No. 2.

separated them he collapsed (fainted), and voided urine involuntarily.

On May 4 he served a bitch, and from that time on started to lose weight, and as the thinness became noticeable, the owner suspected the dog had worms and treated for them, but none were found.

On June 24 I saw the dog for the first time. There was a well-marked broncho-pneumonia present with considerable pleurisy. With treatment the dog made a seemingly good recovery, but convalescence was slow. Several weeks later I was called again, the owner giving me a history of fainting

spells on slight excitement, the appetite normal in every respect. Examined fæces; no ova of parasites were found. Blood smears showed extreme anæmia, no ova of *Filaria immitis* were found, although I suspected these worms on account of the frequent fainting spells. The lungs were congested, pulse irregular and rapid. Dog again showed improvement after administration of strychnine, iron and arsenic. For several weeks showed some improvement in spirits, but none in flesh. Liver was larger than normal, as well as spleen. Spleen being enlarged, I suspected leukæmia, but the blood examination did not assist in this opinion. Showed case at Brooklyn, at State meeting, for examination. No diagnosis was made. Dr. Mangan detected the irregular heart. Early in November again saw the dog, and he had emaciated greatly. Had no difficulty in feeling nodules on spleen and liver. Called Dr. Mangan in consultation, telling him that I suspected tuberculosis. On November 7 the animal was photographed and destroyed.

Autopsy Summary, Case No. 2.—Animal: English bull-dog. Source: Mr. ——. Date of death: November 7. Date of autopsy: November 7.

Anatomical Diagnosis.—External lesions: Greatly emaciated, enlarged liver and spleen, probably tuberculous.

Brain and spinal cord: Not examined.

Heart: Very flabby; endocarditis.

Lungs: Right congested, fibrous and miliary tubercles scattered uniformly throughout; bronchial and mediastinal lymph glands enlarged and caseated. Left glands greatly enlarged, caseous.

Liver: Greatly enlarged, large tubercular masses 1 × 2, 3 × 4½, 5 lb.

Kidneys: Right, several miliary tubercles. Left, several miliary tubercles.

Spleen and lymph nodes: Slightly enlarged, few miliary tubercles.

Pancreas: Normal.

Stomach: Catarrhal.

Small intestine: Miliary tubercles and ulcerated patches.

Large intestines: Miliary tubercles.

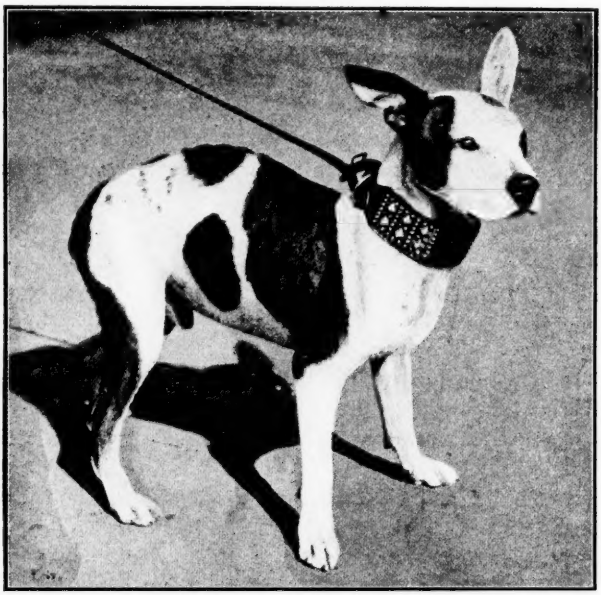
Genito-urinary tract: Normal.

Cause of death: Generalized tuberculosis.

Microscopic examination of lungs, liver, heart, kidney and spleen showed tubercular lesions.

Microscopical Examination of Case No. 2.—Lungs: Numerous large and miliary tubercular foci with much new-formed fibrous tissue, other tubercles caseous. Interstitial tissue greatly increased.

Liver: Blood-vessels congested, much inflammatory tissue surrounding large necrotic area. Extreme fatty degeneration of cells of liver.



Case No. 3. Dog alive.

Heart: Shows extreme fatty changes of muscle fibres.

Lymph glands: Necrotic masses and softening, congestion.

Spleen: Congested.

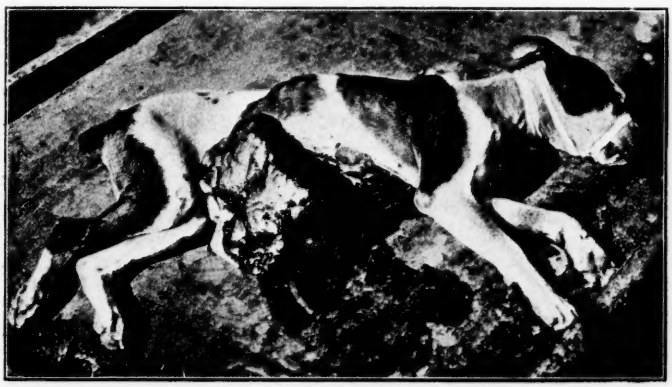
Kidney: Shows degenerated tubercles in cortical portion; chronic nephritis.

Case No. 3.—Bull-terrier, male, 3 years old, had been treated for bronchitis for several weeks, apparently without improvement; appetite good. When presented to me animal showed emaciation, laboured breathing, temperature 103° F. Anæmia. On palpation

I was able to detect nodules on the liver without difficulty. Advised destruction of animal, owner consenting. Autopsy showed generalized tuberculosis, with lesions showing in lungs, pericardium, bronchial lymph nodes, liver, spleen, kidneys. Photographs here shown were made on the same day of the autopsy.

Case No. 4.—Fox-terrier, male. Case examined for Dr. R., of New York City. History of several attacks of broncho-pneumonia, ascites, chronic cough, gradual emaciation during period of several months. Autopsy showed typical tubercular lesions of the liver, kidney, spleen and mesenteric lymph nodes.

Case No. 5.—Fox terrier, male, 6 years old. No good history,



Case No. 3. Same dog, dead.

except unthriftiness for long time. Autopsy: tuberculosis of liver and kidney, very extensive.

Case No. 6.—A very large brindle bull-dog, male, owned by Mrs. F., of New York City. This animal was 9 years old, very fat. Was consulted in May on account of the animal having a chronic cough, occasional diarrhœa, and easily fatigued on slight exertion. Temperature 103° F., rapid respiration, heart irregularly intermittent. Mucous membranes pale. Examined stools for parasites; negative. Gave codeine for the cough, and regulated diet, eliminating all starch substances which formerly made up the principal diet. From May until September did not see this dog again, but when I was called in early in September found a very greatly emaciated animal with a history of chronic

cough, and fainting spells brought on by the animal going up two flights of stairs. Anæmia and jaundice marked, pronounced pleurisy and bronchitis. Found nodules on the surface of the liver, diagnosed tuberculosis, and advised chloroform. The owner did not consent to this, but wished the animal to die a natural death. About two weeks later the owner telephoned, wishing the animal chloroformed, but before I could reach the house the dog had died.

Case No. 7.—French bull-terrier, male, aged 12 years, owned by Mr. S., of New York City, a very healthy, well-nourished, active animal, suddenly developed asthmatic symptoms and ascites. Two quarts of blood-stained serum were taken from abdomen which seemed to give relief for about four weeks, when the dog was again returned on account of excessive fluid in the abdomen. The owner was advised that it was useless to treat the animal, but on account of sentiment refused to have it destroyed, and insisted upon treatment as long as the animal would live without apparent distress.

At intervals of about ten days a large amount of fluid was taken from the animal's abdomen. From the second tapping the dog showed progressive emaciation, and finally, after several months, I was able by palpation to detect the nodules on the surface of the liver. The dog finally died from asphyxiation due to acute œdema of the lungs. The autopsy showed generalized lymphatic tuberculosis.

Case No. 8.—Aged Great Dane, male, with a history of chronic cough, emaciation, irregular temperature, and occasional fainting spells on slight excitement. Pleural and abdominal effusion, and finally death from œdema of the lungs. I was unable to autopsy this animal, owing to my absence from the city at the time of the sudden death.

Case No. 9.—French poodle, 6 years old, female, had been in poor condition for several months. Suffered from occasional diarrhœa but as microscopical examination of the fæces showed that animal was infested with whip-worms, the diarrhœal condition was attributed to these parasites. The animal, after a full meal on a very hot day, had been let out in an exercising field, had a convulsion, and died without gaining consciousness, considerable blood coming from the nostrils.

The autopsy showed death to be due to acute dilatation of

the heart as a result of acute indigestion. The following condition of tuberculosis was found:—

The pleura showed very extensive thickening with a great many pearly-like tubercles scattered throughout the surface. The pericardium was also thickened and tubercles numerous. The lungs were congested and œdematous, and contained many tubercles with numerous irregular-shaped cavities, varying in size from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. in diameter. The cavities were generally collapsed and were lined with necrotic tissue, which had a dirty greyish oily appearance. The bronchial and mediastinal lymph glands were enlarged and showed areas of softening. The liver was congested but not tubercular. The spleen showed four tubercles about the size of a pea on the surface of the organ. These were not close together.

The kidneys were congested, but no tubercles were found. The mesenteric lymph nodes were enlarged, reddish in appearance, and œdematous on section. None showed any necrosis. The intestines showed numerous whip-worms, but no evidence of tubercular ulceration.

Treatment.—The treatment is useless, and when a diagnosis has positively been made, humane destruction is the only thing to be advised. I consider a tuberculous dog, on account of the generally close association with its owner, a very dangerous animal to have about the home, especially if there are young children in the family.

Diagnosis and Conclusions.

I have never made a positive diagnosis of canine tuberculosis except in the advanced stages of the disease. In the last two or three cases the disease had reached the stage of great emaciation when I first saw them, and in these instances palpation of the abdominal organs was a comparatively simple matter. I understand that tuberculin has been used to some extent for diagnosis of this condition in dogs, but in all the cases coming under my observation the animals exhibited very irregular temperatures, frequently several degrees of fever, and the use of tuberculin, it seemed to me, would not lead to any reliable conclusion.

Douville's conclusion upon the result of tuberculin as a diagnostic agent may be summarized as follows: After the injection of 8/10 to $1\frac{1}{2}$ c.c. of tuberculin, the dose depending on the size of the dog, you may get a reaction from the fifth to the eighth hour.

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If after subcutaneous tuberculin the temperature should rise to 104° F. or above, the reaction should be considered as positive.

The injection of tuberculin fails in about 40 per cent. of cases. Sometimes it is dangerous, since it may intoxicate or be followed by death. In cats tuberculin is uncertain, or may be dangerous for animals free from the disease.

The history of cases of tuberculosis in dogs is most important. You will generally learn that the animal has had pneumonia or chronic bronchitis which has not yielded to treatment. The breathing has been rapid and laboured for a considerable time, and does not improve to any great extent while the animal is at rest. The owner cannot understand why the animal does not improve in condition in view of the fact that special attention has been paid to the diet, and considering the amount of nutritious food consumed.

The disease is more frequently seen in adult or aged dogs.

Except in one instance I have never met with tuberculosis in large kennels of dogs, where autopsies are a matter of routine.

In the domestic cat I have seen tubercular enteritis, with ulcerated patches, but generally the disease is of the lymphatic form, the mesenteric glands being generally implicated. These become enlarged, and it is not unusual for this enlargement to be felt by palpation through the abdominal walls.

The kidneys of the domestic cat seem to be often the seat of tubercular infection, and I have found a tubercular kidney three times the normal size.

Tuberculosis is not a rare disease among the larger carnivoræ, as the lion, tiger, leopard, and puma or mountain lion, when subjected to close confinement in menageries or travelling circuses. In these animals the disease generally assumes the lymphatic form, although I have seen cases of pure pulmonary tuberculosis, in which cavities in the lungs were found, which resembled the typical cavitations so frequently found in the human lungs.

I believe that the holding of autopsies upon our small domestic animals should be more frequent among veterinarians than is the practice at present, and, when we consider that there is rarely any objection raised to this procedure, we should realize that we are wasting much valuable material which would enable us to carry out a more scientific treatment if our diagnosis were only partially correct, which, by the way, is liable to occur in the best regulated practice.

It is always a satisfaction to the veterinarian, as well as to his client, to know as a result of the autopsy that the conditions found indicated the correctness of the diagnosis.—*Cornell Veterinarian.*

General Article.

INVESTIGATIONS INTO THE CAUSE OF WORM NODULES (*ONCHOCERCA GIBSONI*) IN CATTLE AT DARWIN, NORTHERN TERRITORY, AUSTRALIA.

By J. F. McEACHRAN, M.R.C.V.S.
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AND
GERALD F. HILL, F.E.S.
Entomologist.

In 1911 a paper on "*Onchocerca gibsoni*, the Cause of Worm Nodules in Cattle," by Drs. Gilruth and Sweet, was published by the Commonwealth Government, and in 1912 appeared a paper by the same investigators, published by the Royal Society of Victoria, entitled "Further Observations on *O. gibsoni*, the Cause of Worm Nodules in Cattle." The history of the occurrence of these parasites in Australia has been fully dealt with in the papers referred to, and also in reports by Drs. Cleland and Johnston, and published by the Bureau of Microbiology, Sydney, the Commonwealth Government, and in other places.

The worm nodules, the structure and general characters of the parasite, have been carefully described by these authors, and as their descriptions rarely conflict, they may be accepted as scientifically correct.

In the slaughter-house at the Dairy Darwin, and on the stations in the coastal belt of the Territory, ample opportunity has been given us of ascertaining the prevalence of worm nodules in the Northern Territory, and there is no doubt that the parasite is extremely prevalent. In the slaughter-house, practically every bullock and cow examined showed worm nodules in the brisket. All breeds of cattle show evidence of infection—the buffalo alone seems to be exempt, but, as little opportunity has been given us for *post-mortem* examination of these animals, we cannot speak authoritatively on this point. In six *post-mortem* examinations of buffalo in the vicinity of Darwin, no worm nodules were discovered, and very careful watch was made for them. Dr. Gilruth's conclusions respecting the practical absence of reinfection after a certain age, and the tendency of the nodule to become smaller, or finally disappear, have been confirmed. The wide prevalence of the parasite amongst the Northern Territory, and the apparent absence of them in buffalo, is very extraordinary, and would direct our attention to the possibility of an intermediary host which attacked cattle, but never or rarely attacked buffalo. The necessity for an intermediary host in the life-history of *O. gibsoni* is manifest, and it is quite unnecessary to reiterate or cogitate upon the conclusions of Drs. Gilruth and Sweet and Drs. Cleland and Johnston in this direction. Many possible intermediary hosts were mentioned, and much experimental work was accomplished.

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but with negative results. No definite host could be decided upon, and further research was required. Evidence certainly pointed to a biting insect—a fly or a louse—as the carrying agent, and the Administrator (Dr. J. A. Gilruth) authorized us to conduct a series of experiments, suggested by him in 1912, the experimental cattle used to be young animals imported from Victoria, where worm nodules were rarely or never encountered amongst locally bred cattle. Towards the end of 1913 negotiations were entered into with the Department of Agriculture, Victoria, for six heifer calves about six months old, and bred in Victoria, to be sent to the Territory. They were tested with tuberculin and shipped in December, five arriving in the Territory on January 6. Unfortunately, one died on the voyage.

No special precautions were taken on board the steamer conveying the calves to the Territory, and there is every likelihood that each or all of them were bitten by *Stomoxys calcitrans*, mosquitoes, and, perhaps, *Tabanidæ* whilst the steamer was moored at ports *en route*, and on the day of arrival in Darwin we had definite knowledge that they had been bitten by *S. calcitrans* and mosquitoes before and during transport to the laboratory buildings at Fannie Bay.

Prior to arrival steps were taken for their reception, and it was decided to place two calves in a screened pen (A) and two in an open pen (B), adjoining the other, but not in communication. The remaining calf was placed with the dairy herd (fifteen in number, eleven of which exhibited well-developed nodules in the pectoral region). These were grazing in the adjoining paddocks, but were milked in an open shed about thirty yards from the open pen (B). The screened pen was constructed as near as possible to exclude biting and other insects, and care was taken during the whole of the experiment to prevent introduction of insects by the attendant during feeding, watering, and cleansing operations. In order to obviate the possibility of insect infestation, a porch-way, with screened double doors, was constructed. The proximity of the infected dairy cattle, and the presence of buffalo in the immediate vicinity (about half a mile distant), the existence of so many insect pests (quite a number of which might be classified as possible carriers of blood parasites), rendered the site chosen for the experiments eminently suitable.

Careful examination, including microscopical examination of the blood of the imported calves, failed to reveal any trace of worm nodules or of embryos.

As regards the relative prevalence of the different species of biting flies in the vicinity of the laboratory, it may be said that *Lyperosia exigua* (buffalo-fly) greatly outnumbered all other species, and caused far more annoyance to stock than the larger flies. The parts usually attacked are the flanks, brisket, withers, ventral surface of the neck, and inner canthi of the eyes. *Stomoxys calcitrans* (stable-fly) were very numerous indeed, specially in proximity to the pens. These flies attack all parts of the beast, but a decided preference is shown for the flanks, brisket, and legs. The various species of *Tabanus* and *Silvius*

were relatively scarce, and were always noticed to attack horses in preference to horned stock, whereas *Stomoxys* and *Lyperosia* showed a marked preference for the latter. *Culicelsa vigilax* (black bush mosquito) were extremely numerous by day and night.

The details of experiments are as follows:—

(1) Experiment to Test whether Imported Cattle free from Onchocerca gibsoni could become Infected by Grazing with Infected Cattle.

Imported calf (*a*), six months old, branded T near shoulder, was placed, on January 7, 1914, with the dairy cattle grazing in the paddock in the vicinity of the laboratory buildings. As a control, a locally bred calf (*b*), four weeks old, was also allowed to run with the cows. The conditions were favourable for natural infection.

Calf (*a*) was slaughtered on July 7, and the *post-mortem* examination gave positive results. Three small nodules, varying in size from a split pea to an ordinary pea, were present—one at the left second sternal segment, one at the junction of the left fourth rib and the sternum, and the third at the junction of the right fourth rib and the sternum. There was no evidence of infestation in other parts of the carcase, including the lymphatic glands.

The control calf (*b*) was slaughtered on July 15, and five small nodules were found—one at the first left sternal span, two at the junction of the sternum and the right fourth rib, and two at the right seventh rib. No nodules were discovered in other parts of the carcase. The nodules were forwarded to Dr. Sweet, in Melbourne, for examination, and her report confirmed the presence of *Onchocerca gibsoni* in the nodules.

Comment.—This experiment clearly demonstrates the presence of worm nodules in a calf reared near the laboratory, and the infection of the imported calf whilst grazing with worm-noduled cattle during the period January to July.

(2) Experiment to ascertain Rôle played by Insects in carrying Onchocerca gibsoni.

On January 7, 1914, two imported calves (*c*) *and* (*d*), six months old, and branded 7 near shoulder, were placed in open pen (B), the floor of which was concreted. The pen was quite exposed, and was only about thirty yards from the bail and cow-yards, where the dairy cows were milked twice daily. In fact, on two or three occasions these cattle were actually within a few yards of the pen, but never in contact with the experimental calves (*c*) and (*d*). No efforts were taken to prevent flies and lice from gaining access to this pen, and, as a matter of fact, from observations made, we know that the following insects attacked the calves during the period of detention:—

Tabanus nigritarsis.—Noticed on several occasions.

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Stomoxys calcitrans.—Very frequently.
Lyperosia exigua.—Very frequently.
Hæmatopinus tuberculatus.—The tails and vulvæ of these calves were examined frequently for lice. On a few adult lice were found at the tip of the tails, and on the dates of slaughter their numbers had slightly increased. A few eggs were found in the usual position, viz., near the roots of the hairs at the tip of the tail.

Ticks were not found on any of the calves concerned in these experiments. The two calves in this open pen, in addition to the controls grazing with other stock in the adjacent paddocks, were accessible at all times to all the arthropods referred to in the first list.

Calf (*c*) was slaughtered on August 7, and the *post-mortem* results were negative for worm nodules. Calf (*d*) was slaughtered on September 7, with similar negative *post-mortem* results.

Comment.—The negative results of this experiment are of very great importance in considering the life-history of *Onchocerca gibsoni*, inasmuch that calves (*c*) and (*d*) had excellent opportunities for infection from biting flies, some of which must surely have previously attacked the infected cows in the neighbourhood. The theory that a biting fly acts as the intermediary host of *O. gibsoni* appears on this experiment not to be well founded, and further evidence must be forthcoming before such a theory can be established. The presence of lice (*Hæmatopinus tuberculatus*) on the tails of these calves seems also to preclude this particular species of louse as an intermediary host of *Onchocerca gibsoni*.

(3) Control Experiment for (2).

On January 7 two imported calves (*e*) and (*f*), six months old, and branded J near shoulder, were placed in a screened pen (A). The calves were never in contact with the infected dairy cows or the other experimental calves. Although the utmost care was exercised to prevent biting flies from entering this pen, the following were found there: *Culicelsa vigilax*. During the first few weeks of these experiments both calves were freely bitten by *C. vigilax*, which were able to pass through the meshes of the wire gauze. Twenty-five specimens, taken in the pen about 8 a.m. on diffeernt occasions between January 8, 1914, and January 31, 1914, were microscopically examined, but no organisms were detected. Others taken under similar circumstances were examined after being kept in captivity for from two to five days, with the same results. *Culicoides subnitidus* (?), "sand-flies," were occasionally found in the adjacent paddock, and could have gained access to the calves, but none were found within the pen. A few *Musca domestica* and *Pycnosoma dux* entered the pen with the attendant, but steps were taken to prevent them remaining there more than a few days. No other insects or ticks were found in the pen, either upon the floor or upon the calves, during the experiments.

Calf (*e*) was slaughtered on August 8, and no worm nodules were discovered. Calf (*f*), slaughtered on September 12, also gave negative results.

Comment.—The negative results in this experiment are particularly interesting in view of the results obtained in Experiment (2).

Experiments with Captive Tabanidæ.

A number of Tabanidæ of four species (*Tabanus nigritarsis*, *T. gregarius*, *T. cinerescens*, *S. elongatus*—the last brought from Batchelor), were starved for varying periods, and then given an opportunity to bite a cow which had a very well developed nodule on the right pectoral region. The skin over the nodule was first shaved, the flies were then placed in a small wire gauze cage, or in a small beaker, and allowed access to the nodule. One species only (*T. gregarius* ?) could be induced to bite, and this but seldom. The flies avoided the nodule as far as possible, preferring the unshaven parts around it. Later on, when the hair had overgrown the nodule, the same preference was shown to the parts away from its summit. Only one fly could have been said to have fed freely upon the nodule. After this feed it was kept for eight days without food, excepting for one small feed of honey and water, when it was carefully examined. The results were negative, as they were in the case of several other flies which had fed round the nodule. These experiments were continued until the end of March, when it became impossible to capture more material.

Hæmatopinus Tuberculatus, Burm. (Buffalo Louse).

It has been found that clean stock become infected soon after their arrival in Darwin. In all cases investigated by us, the tips of the tails were infected by adults, which oviposted first on the hairs growing from the extreme tip, and afterwards along the tail for a length of 8 in. to 12 in. The eggs were deposited on the hairs from $\frac{1}{4}$ in. to 6 in. from the roots (as many as eighty eggs being placed on a single hair), and hatched in from four to six days. Shortly after hatching the young larvæ commenced to travel up the tail, generally on the dorsal surface until within a few inches of the base, when they worked round to the ventral surface and attached themselves firmly to the fine hairs round the anus and vulva and on the escutcheon, where they remained until the nymphæ were about half-grown. We have never found adults on these latter parts, nor have we found half-grown nymphæ on the tail—facts which seem to indicate that after reaching a certain stage of development the nymphæ drop from the anus, vulva, and escutcheon to continue their growth on the ground. This point in their life-history is now being further studied by one of us. To our knowledge, *Hæmatopinus tuberculatus* has never been found on the bodies of cattle—either

domestic or running wild—nor has it been found upon the bodies of wild Brahma cattle, although the tails of the latter are infected. On the other hand, one of us has had opportunities for examining a number of Swamp buffaloes, and has found these lice on the tails, flanks, necks, and bellies of the majority. In these animals the tail, vulva, anus, and escutcheon are less subject to infection than the body. The nature or absence of the hair probably determines the choice of position selected by the lice.

Conclusions.

The results of the experiments may be summarized as follows:—

(1) Local cattle may become infected with worm nodules a few months after birth, as well-developed nodules were found in calf (*b*). Cattle from Victoria where worm nodules are rarely, if ever, present, grazing in the ordinary manner with infected cattle may become infected with *Onchocerca gibsoni* within six months, as typical nodules were discovered in calf (*a*).

No evidence can be adduced regarding the mode of infection.

(2) The housing arrangements of calves (*c*) and (*d*) were such that biting and flying insects had ready access to the animals, and as the distance from the infected cows was not great, we can certainly assume that these biting and flying insects had good opportunities for infecting the calves. The fact that they were not affected during the seven to eight months' period of exposure to possible insect vectors apparently indicates that the intermediary host is not a biting or flying insect, and even an ordinary skin parasite, *e.g.*, *Hæmatopinus tuberculatus*, which travels a short distance, may be eliminated.

(3) The negative result of this experiment, as also (2), points to the probability of the intermediary host of *Onchocerca gibsoni* being on the ground. Both pens were floored with concrete; the experimental calves had no chance of lying on or near the ground where infected cows had previously laid. It seems to us to indicate that part of the life-history of the parasite is spent on the ground.

Since these experiments were finalized, we have received Dr. Cleland's report on his further investigation into the etiology of worm nests in cattle. We note his remarks on the possibility of *Stomoxys calcitrans* or *Culicelsa vigilax* acting as intermediary hosts of *Onchocerca gibsoni*. In the light of our knowledge here, and in view of the results of the experiments conducted at the laboratory, we cannot add support to his contentions.

Suggested Future Experiments.

(1) A further series of experiments on similar lines to No. 1 already conducted, to be commenced at a later period of the year, say, from June to December. Such experiments would determine whether cattle become infected at a period when biting flies are not numerous.

(2) Experiments Nos. 2 and 3 should be again followed, but on different lines; one calf to be housed in an open pen with the ordinary ground floor, and infected cattle allowed to come right alongside. Another calf to be housed in a pen raised on piles from the ground, discs being placed in piles, and tanglefoot or an insect repellant smeared on piles below discs. The infection of the calf in the ground pen would demonstrate the possibility of infection from a winged or crawling insect; and the infection of the other calf would exclude the latter.

(3) A special study of the biting flies of the Territory should be made, particular attention being devoted to those which attack buffalo, and also ground insects which may be possible vectors.

(4) Regular microscopical examination of biting insects and further experiments with captive biting flies.

POISONOUS PLANTS.

Order Solanaceæ.

By J. B. CLELAND.

Datura Stramonium, Linn. "Mad apple," or "thorn apple." — . . . "This plant is decidedly poisonous, although it is questionable whether it is often eaten by stock, except by quiet milkers and working bullocks, which sometimes nibble at it. In 1874 the stomach of a cow, the property of the police magistrate at Toowoomba, that had died from some cause, was forwarded to Mr. K. T. Staiger, then Government analyst, for analysis, and he found a quantity of this plant in the stomach. The cow had been browsing on land about the outskirts of Toowoomba, where this plant was at the time growing in great abundance."—Bailey and Gordon.

Turner refers to this plant as a supposed Western Australian poison plant.

Datura Leichhardtii. F.v.M. Native "thorn apple."— . . . "This plant is met with in the northern parts of South Australia, North Queensland, and North Australia. From several localities it has been sent to Brisbane as a suspected poison herb."—Bailey and Gordon.

Nicotiana suaveolens, Lehm. Native tobacco.— . . .

XUM

"Met with in one or other form in all the Australian colonies. There is a general consensus of opinion amongst stock-owners that this plant is poisonous to stock. It is credited with causing the deaths of many travelling sheep. Mr. Hutchison instances a case which came under his notice of 300 rams being poisoned by it. The effects upon sheep are drooping head, dull eyes, swollen tongue, and, a few hours before death, paralysis of the loins. Dr. T. L. Bancroft, in a note communicated to the Royal Society of Queensland in January, 1886, has shown that this plant is undoubtedly poisonous, and that this is due to the presence in it of an alkaloid having all the physiological properties of the nicotine of the true tobacco plant."—Bailey and Gordon.

Turner gives it for Western Australia.

Maiden states that this is an indigenous tobacco containing only a small quantity of nicotine, and that sheep, cattle, and horses browse on it more or less with their feed, and as a very general rule it does them no harm. At the same time authenticated cases of poisoning from eating this plant do not appear to be available, but inasmuch as deaths do occur to travelling stock—*i.e.*, those which, tired and hungry, gorge themselves with the plant—he suspended judgment that the cause of death may be nicotine poisoning.

Nicotiana glauca, Grah. "Tree tobacco," "wild tobacco."—Maiden (*Agricultural Gazette of New South Wales*, 1897, p. 15) states that this South American plant is very occasionally sent to Sydney from the interior of the colony as a poison plant, but he thinks without sufficient proof. He quotes Professor M'Owan, of the Cape of Good Hope, as saying, "There are conflicting accounts respecting the poisonous qualities of this plant in this country. Occasionally we hear of young ostriches being poisoned through eating its leaves, but shall be glad to get any authentic reports on the subject, as it appears to be very likely to be injurious to all kinds of stock." Mr. Bailey says: "It cannot be very poisonous, because fowls eat it greedily in autumn when green stuff is scarce, and horses browse upon it, and neither fowls nor horses appear to be injuriously affected by it."

[The tobacco plant is now grown in England].—*Report of the Government Bureau of Microbiology, New South Wales.*

NOTE ON A FEEDING EXPERIMENT WITH *CYSTICERCUS TENUICOLLIS* AND *ECHINOCOCCUS VETERINORUM*.

By J. B. CLELAND, M.D., Ch.M.

During the feeding of a dog with specimens of these two species of Cysticercus from a sheep, for the purpose of obtaining the adult tape-worms in the intestines of the dog, the following interesting points were noticed, which illustrate the way in which the perpetuation of each of the species is achieved, in spite of the danger of injury during eating.

In the case of the Echinococcus, numerous scolices are of course present in fertile cysts, representing the immature heads of future tape-worms. Though such a cyst, embedded in the substance of the liver, must be severely crushed during the process of mastication, and many of the scolices must be thereby injured, a number of these must still escape destruction and be able to mature later on in the intestine.

In the case of the *Cysticercus tenuicollis*, however, in each individual cyst there is only one head of the future tape-worm (*Tænia marginata*).

It happened that during the feeding of the dog these two types of cyst, embedded in or attached to portions of the liver of a sheep, were presented to the animal. Those portions containing Echinococci were crunched up by the jaws of the animal and eventually swallowed. When, however, the piece of liver, to which by its long pedicle was attached the *Cysticercus tenuicollis*, was taken into the mouth of the dog, the liver was seized and masticated, while the cyst remained hanging out of the side of the mouth by its long attachment. When the animal had sufficiently masticated the liver, this was swallowed, and in the process the intact cyst was carried down into the stomach. In this way the single head present in the *Cysticercus tenuicollis* escaped all injury from the jaws. It would seem, therefore, that the lax condition of this cyst tends to lessen its risk of rupture by pressure with subsequent injury to the head, whilst its pedunculated character still further protects it when portions of liver or other viscera to which it is attached are seized and eaten by dogs.

This difference between the two cysts has doubtless received attention previously. Nevertheless it seems worth while again recording.—*Report Government Bureau Microbiology, New South Wales.*

XUM

Reviews.

Veterinary Therapeutics: a Guide to the Treatment of Disease in the Domestic Animals. By E. Wallis Hoare, F.R.C.V.S., Lecturer in Veterinary Hygiene, University College, Cork, Editor of "A System of Veterinary Medicine"; Editor of Clinical Department, *The Veterinary News;* Honorary Member of the American Veterinary Medical Association, &c. Third Edition. Demy octavo. Pp. xxiv + 943. Published by Baillière, Tindall and Cox, 8, Henrietta Street, Covent Garden. 1916. Price 18s. net.

This, the third edition of "Veterinary Therapeutics," has been entirely rewritten by the author. It has been modernized, and due regard is given to the fact that drugs are intended to aid the forces of failing or weakened Nature and not to command them. A knowledge of physiology is really the basis of therapeutics. The information with reference to the preparation of drugs is not elaborate, but sufficient for the needs of the practitioner and student.

Inasmuch as one cannot treat disease without making a diagnosis of it, first place is given to the recognition and general symptoms of illness, and the bedrock of successful treatment is discussed and elucidated in a very valuable section on the Care, Management, and Nursing of Sick Animals. The practice of examining the urine of ailing subjects is not adopted generally in veterinary practice, and yet it is quite important in many cases. The tests given by the author are not hard to carry out, and will furnish the clinician with much valuable knowledge, and seldom have we read (never in veterinary text-books) such a complete list. Horses, cattle, sheep, pigs, dogs, cats, and birds are dealt with in their class with respect to care, management, and nursing, and if we get those under us who have a good knowledge of the matter derived from these pages, then our tasks will be lightened, and we shall be approaching the human standard of nursing, whilst if we are competent to give the instructions ourselves and see them carried out our patients will be under the best conditions for recovery. We all know, however, the difficulties, in many cases insuperable, that we have to contend with in this respect, and there is something in the suggestion that easily accessible animal hospitals are the best instruments to ensure and propagate a knowledge of ideal curative tending and care.

The Materia Medica section, comprised in Part II, is condensed yet complete. We do not note the omission of any really valuable agent either ancient or modern. There is a very useful chapter on animal extracts, vaccines, sera, &c. Marvellous to relate, the text in this section is at times very interesting reading. The man is an artist that can make the description of the preparation and uses of drugs delectable, and if more attention was given to this matter we might possibly have more real live

chemists in our land. For some time we have desired to gain a more complete knowledge of hypodermic medication in animals. We think there is room for a little book to be devoted entirely to the subject. The work under review does not advance our knowledge of this subject.

The third section on Special Therapeutics will be very acceptable to the practitioner. It is not too lengthy, and can at all times be consulted with advantage.

In regard to red-water, the author does not seem to believe that all the cases here are due to ticks, and we are inclined to agree with him. The writer advocates early tapping in cases of pleuritic effusion. When fluid comes through the canula the practitioner gains credit, and the procedure does good. When nothing emerges the owner is not greatly struck by the operation, and may even think that the practitioner has made a mistake in his diagnosis. The lines on passing the stomach tube are very instructive, and those of us who desire to get out of routine and rut in the treatment of gastric impaction and tympany may read them with profit. In the Appendix many useful formulæ are given, which we hope will be adopted more by the practitioner than the general public. In the preface to his work the author states that the list of drugs (their actions and uses) is limited to those whose practical utility has been demonstrated clinically. We can only conclude that experience has proved the efficacy of the absorbent (?) liniment for capped hocks given at the top of p. 894, otherwise we should think that a mistake had occurred.

The book is well printed and bound, marks an advance in an inexact science, and is quite up to date in its matter and compilation. It should have a wide circulation and enhance the reputation of its author and our profession. Messrs. H. Begg, G. Mayall, W. M. Scott, and H. Gray have given Mr. Hoare assistance and co-operation in the production of the work.

G. M.

The Cornell Veterinarian. April, 1916. Edited by C. P. Fitch. Published by D. H. Udall, Ithaca, N.Y. Price $1 per year.

This is a specially good number of the periodical. The Editor comments on a Bill before Congress which deals with the automatic promotion of veterinary and lay inspectors in the U.S. Bureau of Animal Industry. The remuneration of the veterinary inspectors starts at 1,400 dollars per annum, and rises to 2,400 dollars, and afterwards at the discretion of the Secretary of Agriculture. The lay inspectors are to receive maximums of 1,600 or 1,800 dollars according to their grade. The Editor considers that the lay salaries are somewhat high as compared with the veterinary ones. A. Eichorn, Chief of the Pathological Division Bureau Animal Industry, contributes a well-thought-out paper on Biological Therapeutics. There are clinical records by W. Reid Blair on Tuberculosis in the Dog and Cat, and interesting notes by H. J. Milks on Verminous Bronchitis in Dogs, whilst W. L. Williams discourses on the Diagnosis of

XUM

Pregnancy in Cattle. There are two case records of gastro-intestinal catarrh in cattle which were treated at the Ambulatory Clinic, N.Y. State Veterinary College. The reviews include those of the "American Illustrated Medical Dictionary," by W. A. N. Dorland, and "Essentials of Veterinary Law," by H. B. Hemenway.

ARMY VETERINARY SERVICE.

TEMPORARY Lieutenants to be temporary Captains: T. F. O'Brien, S. H. Skelton, W. Burt, T. H. Sherlock, F. Birkin, L. W. Heelis, J. E. Hutchinson.

Lieutenant-Colonel G. Elphick relinquishes commission, with permission to retain rank and wear prescribed uniform.

The surname of Lieutenant F. Morphy is as now described, and not as in *Gazette* of May 2.

Temporary Lieutenant A. Cowan relinquishes commission on termination of agreement. Temporary Lieutenant H. A. King relinquishes his commission on account of ill-health.

R. G. Wilson, J. A. Brew, and Kenneth D'Arcy Sewell to be temporary Lieutenants.

J. Scott, late temporary Lieutenant, to be temporary Captain. W. P. B. Beal to be temporary Captain (substituted for notification in *Gazette* of August 30, 1915).

Captain H. G. Westgate relinquishes commission on account of ill-health.

To be temporary Lieutenants: F. C. Golden, J. R. Barker.

Captain (temporary Major) J. E. L. Still relinquishes temporary rank on alteration in posting. Captain J. L. C. Jones to be A.D.V.S., and is granted temporary rank of Major while holding the appointment.

B. A. McGuire to be temporary Lieutenant.

F. E. Jones to be Lieutenant.

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